

1 **Inferential comprehension abilities in French-speaking preschoolers exposed**
2 **to neglect in the Early Longitudinal Language and Neglect study**

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22 **Abstract**

23 **Purpose:** Using a longitudinal design, this study aimed to describe inferential comprehension
24 abilities of neglected French-speaking preschool children from 42 to 66 months old of age in
25 comparison to non-neglected peers; to examine the association with receptive vocabulary; and to
26 determine whether rates of change in inferential abilities over time was stable between the two
27 group conditions.

28 **Method:** An inferential comprehension task and the French version of the PPVT-4 were
29 administered to a group of neglected children ($n = 37-40$) and to a group of same age non-
30 neglected children ($n = 71-91$) at 42, 54 and 66 months old, as part of the *Early Longitudinal*
31 *Language and Neglect* study.

32 **Results:** Results show that children exposed to neglect obtain significantly lower scores
33 compared to their same age peers on inferential comprehension and receptive vocabulary
34 measures at all three time points ($p < .001$) with large to very large effect sizes and indicate
35 moderate to strong correlations between the two variables. Children from the neglected group
36 present difficulties in inferencing compared to same age non-neglected peers, a disadvantage that
37 remains stable over time.

38 **Conclusions:** This study demonstrates the significant gap in inferential comprehension abilities
39 between neglected and non-neglected preschool children. These results reiterate the importance
40 of early detection of language comprehension difficulties in young children coming from
41 vulnerable environments.

42

43 **Keywords:** Neglect, Language, Inferential comprehension, Receptive language; French-speaking
44 preschoolers

45 **Introduction**

46 Child maltreatment comprises acts of commission, that is, physical, sexual, or emotional abuse,
47 and acts of omission, that is child neglect (Leeb et al., 2008). In the province of Québec
48 (Canada), where the current study takes place, child neglect is defined by exposure to situations
49 in which the caregiver, most often the parents, does not meet the child’s basic needs (physical,
50 emotional, and/or educational), which can jeopardize the child’s development and well-being
51 (Québec Youth Protection Act, Chapter 38b). In that same province, about 1% of all children
52 under the age of 6, the equivalent of more than 6000 children, were under the care of youth
53 protection services because of exposure to neglect or serious risk of neglect in 2020-2021 (Bilan
54 des directeurs de la protection de la jeunesse, 2022).

55 These numbers are particularly worrisome as the experiences of early childhood shape
56 learning, overall development, and health throughout life (Center of the Developing Child,
57 2007). Serious consequences of maltreatment including neglect are well documented (Young-
58 Southward, et al., 2020; Masson, et al., 2015). The exposure to neglect can compromise the
59 neurological, cognitive, including language, and socioemotional development of young children,
60 as well as their educational success (DePanfilis, 2006; National Scientific Council on the
61 Developing Child, 2012; Norman et al., 2012; Norrie McCain, 2020; Pace et al., 2019). The
62 emotional well-being, mental health, physical health, social skills, cognitive and language
63 abilities that emerge in the early years are all important prerequisites for the overall child’s well-
64 being (Law et al., 2017). Research has pointed out that, among all spheres of development,
65 language is the most likely to be disrupted or delayed in a situation of neglect (McDonald et al.,
66 2013).

67 *Language difficulties in children exposed to neglect*

68 The high vulnerability of language development in children who have experienced
69 neglect have been highlighted (McDonald et al., 2013), explained by the very nature of neglect
70 which is characterized by severe disruption of the interaction between a caregiver and a child
71 (Sylvestre, 2021). The important reduction in both quantity and quality of interactions,
72 particularly with regards to the use of parental behaviors favorable to language development, can
73 potentially negatively impact all aspects of both receptive and expressive language (Di Sante et
74 al., 2020).

75 In a meta-analysis conducted by Sylvestre and colleagues (2016), children under the age
76 of 12 who experienced abuse and/or neglect performed .48-.67 standard deviations lower than
77 non-abused children on several standard receptive and expressive language measures, with
78 moderate to large effect sizes. These results are in line with those emerging from another meta-
79 analysis investigating language in maltreated children (abused and/or neglected), in which the
80 observed effect sizes were moderate for receptive vocabulary and receptive language, and large
81 for expressive language (Lum et al., 2015).

82 In a cross-sectional study on young neglected children, the proportion of children with
83 language difficulties was established at 23.8% between 2-8 months, 39.1% between 9-20
84 months, and 41.7% between 21-36 months (Sylvestre & Mérette, 2010). Thus, at 3 years of age,
85 the prevalence rate of overall language difficulties was two times greater among neglected
86 children than those observed in the general population, estimated at 20% (Zubrick et al., 2007).
87 After the age of 3 years, research on neglected children has shown language difficulties in the
88 areas of receptive and expressive vocabulary (Fox et al., 1988; Spratt et al., 2012), in addition of
89 pragmatics (Di Sante et al., 2019) and morphosyntax (Julien et al., 2019).

90 Regarding pragmatics, at 3.5 years of age, children exposed to neglect presented ten
91 times more significant pragmatic difficulties (44.4%) compared to their same age peers (4.2%)
92 (Di Sante et al., 2019). For morphosyntax, results obtained by Julien and colleagues (2019) with
93 children aged 4 years indicated that 25.6% of the neglected children presented clinically
94 significant morphosyntactic difficulties, while this proportion was at 4.7% among their non-
95 neglected peers. In addition, receptive vocabulary measures obtained with the PPVT-R pointed
96 to significantly lower scores in children aged 3 to 8 years compared to a control group exhibiting
97 a less advanced knowledge of vocabulary at that age (Fox et al., 1988). Finally, compared with
98 non-neglected children, the neglected children performed significantly lower on a measure of
99 expressive vocabulary (Spratt et al., 2012).

100 Taken together, these findings indicate that very early in life, neglected children show
101 significant gaps in their language development compared to non-neglected children, especially
102 when examining aspects of pragmatics, morphosyntax and both expressive and receptive
103 vocabulary. However, when it comes to inferential comprehension, a complex language ability
104 fundamental for the development of social competence and reading comprehension (van Kleeck,
105 2008), no research data is yet available.

106 ***Inferential comprehension***

107 Inferential comprehension, defined as the ability to understand information that has not
108 been explicitly stated, plays an important role in the development of social competence and
109 reading comprehension (Filiatrault-Veilleux et al., 2015; Griffin et al., 2004; Kendeou et al.,
110 2008; Kendeou et al., 2009; Paris & Paris, 2007; Storch & Whitehurst, 2002; van Kleeck, 2008).
111 Inferencing is considered a part of broad cognitive strategies, often referred to as “meaning-
112 related skills”, necessary for both extracting and creating meaning from messages

113 (RAND Reading Study Group, 2002). These processes help the reader or listener to fill gaps in
114 the information provided, to create links between different sources of information, and to
115 supplement meaning with prior knowledge (Bishop, 2014; Cain & Oakhill, 2014; van Dijk &
116 Kintsch, 1983; van Kleeck, 2008). As a result, inferencing enables the construction of a coherent
117 and complete mental representation of an oral or written message, which is deemed necessary for
118 comprehension (Cain et al., 2003; Trabasso & Wiley, 2005; van den Broek et al., 2005).

119 In addition, inferential comprehension at the discourse-level plays a key role on a child's
120 ability to participate in communicative and social interactions (Westby & Washington, 2017).
121 For example, when engaged in play or conversation, children must understand explicit – and
122 implicit - messages expressed by peers. They may have to use background knowledge or scripted
123 knowledge and/or to make causal connections between events or actions to understand what has
124 happened or what is happening (Kendeou et al., 2020). Inferential comprehension is therefore
125 reported as part of the important set of skills used in educational settings, in both oral and written
126 discourse-level activities, including narratives.

127 Using shared-book reading activities, researchers have documented developmental trends
128 in inferencing ability in typically developing children as young as 3 to 4 years of age (Dawes et
129 al, 2019; Filiatrault-Veilleux et al., 2016; Paris & Paris, 2003; Paris et al., 1977; van den Broek
130 et al., 2005). Causal inferences are directly related to story grammar elements of narratives
131 which may involve the initial event, the internal responses of the characters, the problem, the
132 attempts to solve the problem, the resolution, the goal, or the theme of the story (Filiatrault-
133 Veilleux et al., 2015; Filiatrault-Veilleux et al., 2016; Makdissi & Boisclair, 2006; Paris & Paris,
134 2003; van Kleeck, 2008).

135 At 4 years of age, children can provide adequate answers to questions about the
136 character's main problem and emotions (Filiatrault-Veilleux et al., 2016). By the age of 5 and 6,
137 typically developing children can infer consequences of actions or events as well as attempts to
138 solve a problem (Filiatrault-Veilleux et al., 2016), and may be able to predict what will happen
139 next (Adams et al., 2009). More recently, Dawes and colleagues (2019) obtained a similar
140 pattern of results in children aged 4 to 6 years of age, which confirm the development of oral
141 narrative comprehension in young typically developing children, especially using scripted causal
142 inferences questions in narratives.

143 ***The role of receptive vocabulary in inferential comprehension***

144 Past evidence has also shown a positive relationship between vocabulary knowledge and
145 performance at answering inferential comprehension questions (Filiatrault-Veilleux et al., 2016;
146 Paris & Paris, 2003). In particular, Silva and Cain (2015) reported that receptive vocabulary
147 emerged as the only significant predictor of inferential narrative comprehension in children aged
148 4 to 6 years of age, among receptive vocabulary, grammar and verbal short-term memory. In
149 fact, both inferencing skills and vocabulary knowledge have been investigated in children aged
150 4-6 years of age because of their unique contribution to narrative listening comprehension
151 (Kendeou et al., 2008; Sénéchal et al., 2006).

152 Of note, Lepola and colleagues (2012) reported that inference-making skills in children
153 aged from 4 to 6 years contributed both directly and indirectly, through vocabulary knowledge,
154 to narrative listening comprehension in children of 6 years of age. Therefore, given the high
155 prevalence of language difficulties among children exposed to neglect, especially with specific
156 regards to receptive vocabulary (Eigsti & Cicchetti, 2004; Lum et al., 2015) and its role in
157 inferencing, children who are neglected might experience inferential comprehension difficulties

158 from a young age. At this time, no research has examined the inferential comprehension abilities
159 of young children exposed to neglect. Considering the importance of inferential comprehension
160 in the development of social competence, oral language and reading abilities (Filiatrault-Veilleux
161 et al., 2015; Kendeou et al., 2008; Kendeou et al., 2009; Paris & Paris, 2007), there is a clear
162 need to investigate inferential comprehension abilities in these children.

163

164 **The current study**

165 Using a longitudinal design, this study explores the inferential comprehension abilities of
166 French-speaking neglected preschool children from 42 to 66 months old. The objectives of this
167 study are threefold:

- 168 1. describe inferential comprehension abilities and receptive vocabulary in children exposed to
169 neglect, in comparison to same age non-neglected peers at 42, 54 and 66 months old;
- 170 2. examine the relations between inferential comprehension and receptive vocabulary;
- 171 3. and determine whether rates of change in inferential abilities over time are stable between the
172 two group conditions.

173

174 **Method**

175 This study was part of the longitudinal study on the language development of neglected French-
176 speaking children aged 3–5 years, the Early Longitudinal Language and Neglect [ELLAN] study
177 (Sylvestre et al., 2014-2019). The ELLAN study included 69 neglected children recruited from
178 four Child and Youth Protection Centres of the province of Québec, Canada (Québec City,
179 Montréal-francophone sector, Chaudière-Appalaches and Laval), which are mandated to assess
180 children's safety and ensure the protection and well-being of maltreated children. A comparison

181 group consisting of 99 non-neglected children of the general population was also recruited in
182 childcare centers in the Québec City and Montréal regions. Over the course of the study,
183 language abilities of the children were measured six times, once every six months. This study
184 was approved by the research ethics committees of the Centre Jeunesse de Québec (CJQ-IU-
185 2014-03) and the Centre Jeunesse de Montréal (CJM-IU 14-05-06).

186

187 ***Participants***

188 At the onset of the ELLAN study, children had to be 36 months old (+/- 1 week) and had to be
189 monolingual French speakers (i.e., exposed to French more than 90 % of the time since birth:
190 Pearson et al., 1997). Children presenting a condition associated with language difficulties (e.g.,
191 hearing loss) were excluded. Participants in the group of neglected children had to be under the
192 care of Youth Protection Services in the province of Québec due to exposure to neglect or a
193 serious risk of neglect, which was the main type of maltreatment children were experiencing.

194 The data used in this study are those collected when children were 42 months old (T1),
195 54 months old (T2) and 66 months old (T3). The sample of neglected and non-neglected children
196 varied at each time point, as is common in longitudinal samples, and due to some technical
197 difficulties with the material (e.g., malfunction of the camera) or children experiencing
198 difficulties with the task (i.e., lack of collaboration, behavioral difficulties, incapacity to
199 complete the task). Specifically, 37 neglected and 91 non-neglected children participated at T1
200 (42 months); 40 neglected and 71 non-neglected children participated at T2 (54 months); and 40
201 neglected and 86 non-neglected children participated at T3 (66 months). At the first data point of
202 the current study (T1), children did significantly differ with regard to their age ($t(126) = 3.280, p$
203 $= .001$). Children from the neglected group were slightly older ($M = 42.29, SD = .43$) than the

204 children from the non-neglected group ($M = 42.08$, $SD = .28$); but this age difference, which only
205 amount to a few days, was not considered large enough to influence the findings of this study.
206 The age of the participating parent (in years) did also differ between the two group conditions (t
207 $(126) = 2.021$, $p = .045$); the parents from the neglected group ($M = 38.32$, $SD = 10.72$) were
208 older than the parents from the non-neglected group ($M = 35.55$, $SD = 4.84$). No difference was
209 found regarding the gender of the participants [Chi-square $(1, N = 128) = 2.697$, $p = .101$].

210 Family sociodemographic variables were collected upon study entry of the ELLAN
211 study (participants at 36 months old) and are presented in Table 1. As expected, given the high
212 vulnerability of maltreating families on a personal, family, and social level (Rijbroek et al., 2019;
213 Vial et al., 2020), the two groups differ significantly in terms of their social characteristics.
214 Compared to the non-neglected group, the neglected group presents more socioeconomic risk
215 factors, namely, single parenthood, low education, and poverty. More specifically, there are more
216 single-parent families in the neglected group (35.1% vs 3.3%, $p < .001$); there is a higher
217 proportion of families with more than two children (45.9% vs 22.0%, $p = .007$); there is a higher
218 percentage of the responding parental figure without a high school diploma (48.6% vs 5.5%, $p <$
219 $.001$) and the gross annual household income falls below the low-income threshold for a greater
220 number of families in the neglected group (46.9% vs 3.4%, $p < .001$). The low-income cutoff is
221 based on data from the year the study began (Statistics Canada, 2016).

222 Insert Table 1 around here

223
224 ***Measures and procedure***

225 Data were collected by a trained research assistant at the participant's home during three separate
226 60-minute visits one year apart, at T1 (42 months of age), T2 (54 months of age) and T3 (66

227 months of age). Financial compensation was provided to the parent and a gift was given to the
228 child following each visit.

229

230 ***Receptive vocabulary.*** The French version of the Peabody Picture Vocabulary Test–
231 Revised (PPVT-R); the *Échelle de Vocabulaire Image Peabody*, Form A (ÉVIP; Dunn et al.,
232 1993) is a standardized test measuring receptive vocabulary of children aged 2 to 18 years. In
233 this test, the child is asked to identify the image named out loud by the experimenter, among a
234 set of four possible images. The test includes 170 items of increasing difficulty. The
235 administration of the test concludes once the child makes six errors within a sequence of eight
236 consecutive items. The raw score is determined by adding up the number of correct responses.
237 This procedure is derived from the original PPVT-R and the terms included in the French version
238 constitute a representative sample of the French language (Pauzé et al., 2004). The reported
239 homogeneity coefficients range from .66 to .88 across different age groups, while the test-retest
240 reliability coefficient is .72 (Dunn et al., 1993).

241 ***Inferential comprehension.*** An assessment tool entitled *Évaluation de la Compréhension*
242 *Inférentielle en Récit (É.C.I.R.)* consisting of a dialogic reading task with scripted causal
243 inferential questions was used (Filiatrault-Veilleux et al., 2016; Filiatrault-Veilleux &
244 Desmarais, 2020). The *É.C.I.R.* is a 20-page long story that follows a predictable narrative
245 structure (i.e., initiative event/problem, internal response, goal, prediction, attempt to solve the
246 problem, and resolution). The narrative revolves around Pinson, a baby bird. It begins when
247 Pinson’s parents leave in search of food, leaving him alone in his nest. As a storm approaches,
248 his nest falls. He is wet and scared and starts his quest for a shelter. He encounters three
249 characters (a skunk, a porcupine, and a beaver) who attempt to help him, but nothing works. In

250 the end, a boy builds a new house for Pinson and his parents return. In the context of the current
251 study, the task was presented on an *iPad*. The child is asked to respond to nineteen online pre-
252 recorded inferential questions to assess six causal inference types related to story grammar
253 elements. Each question targets information never mentioned explicitly by the narrator within the
254 story and thus requires inference comprehension. The inference types, story context, examples,
255 and number of questions from the task are shown in Appendix A (Table 5).

256 The child's responses obtained to each question were transcribed, then scored by two
257 trained research assistants according to four categories following a quality continuum ranging
258 from expected to inadequate (3 points = expected, 2 points = incomplete, 1 point = low
259 contingency, 0 point = inadequate or off topic). This scale was inspired by the scoring system of
260 the Preschool Language Assessment Instrument–Second Edition (Blank et al., 2003) and was
261 used in a previous narrative-based experimental task of inferential comprehension (Desmarais et
262 al., 2013; Filiatrault-Veilleux, et al., 2015). The total raw score is calculated out of 78 points. A
263 picture, question, examples of responses and attributed score per category following the quality
264 continuum of the scoring system in the *É.C.I.R.* are presented in Appendix B (Table 6).

265 Administration and scoring procedure of the *É.C.I.R.*, finalized after a thorough
266 validation process, and the confirmation of its psychometric properties, are reported in a previous
267 article (Filiatrault-Veilleux et al., 2016) and summarized here. Of note, the reported Kaiser–
268 Meyer–Olkin value resulting from the factorial analysis of the six inference types was .87. The
269 concurrent validity coefficient, assessed in comparison with a previous experimental task of
270 inferential comprehension (Desmarais et al., 2013; Filiatrault-Veilleux et al., 2015) was .77,
271 whereas the convergent validity with receptive vocabulary was .43 (as assessed with the French

272 version of the PPVT–R; Dunn et al., 1993). The scoring system of the task, created in
273 collaboration with three experts in the field, had a reported interrater reliability coefficient of .99,
274 and a test–retest reliability coefficient of .95 (Filiatrault-Veilleux et al., 2016).

275 ***Data analysis***

276 Analyses were all performed using SPSS IBM’s Statistics 26 for Windows. First, the two group
277 conditions were compared according to socio-demographic variables using the Chi-square test.
278 Then, independent t-tests were initially performed to find differences between group
279 performances at each time point on both measures of inferential comprehension and receptive
280 vocabulary (objective 1). Cohen’s *d* was calculated to indicate the effect size, with a small effect
281 size defined as $d = 0.2$, a moderate effect size as $d = 0.5$, a large effect size as $d = 0.8$ and a very
282 large effect size as $d = 1.3$ (Cohen, 1988; Ferguson, 2009; Rosenthal, 1996). Pearson’s *r*
283 correlations were conducted to examine associations between variables (objective 2). To
284 determine whether rates of change in inferential abilities over time was stable between the two
285 group conditions (objective 3), a 3 (time: T1, T2, T3) by 2 (two group conditions, neglected vs
286 non-neglected) repeated measures analysis of covariance (ANCOVA) on inferential
287 comprehension was conducted. Receptive vocabulary at T1 was entered as a covariate. The
288 Group condition x Time interaction was tested and an effect size (Cohen’s *d*) measuring the
289 difference between the two group conditions’ trajectories (neglected vs non-neglected) was
290 calculated. Within a group, a trajectory was illustrated by a line connecting the mean raw scores
291 of inferential comprehension across the three time points (42 months, 54 months, 66 months of
292 age). Normality of data was assessed using the Shapiro–Wilk test on all variables. A significance
293 level of $p < .05$ was used for all statistical analyses.

294 **Results**

295 To address our first objective, descriptive statistics (means, standard deviation, and range) at
296 each time point for the neglected and non-neglected groups are reported in Table 2. A series
297 of independent t-tests with group condition as the independent variable was conducted on all the
298 measures of inferential comprehension (T1, T2, T3) and receptive vocabulary (T1, T2, T3), in
299 addition of effect sizes using Cohen’s *d* (Cohen, 1988). As can be seen in Table 2, children
300 exposed to neglect obtain significantly lower scores than the non-neglected group on all six
301 measures ($p < .001$) with large to very large effect size values of 1.010 to 1.319. In addition, a
302 percentage of inability to complete the inferential comprehension task was calculated per group
303 condition. Of note, 8 out of 37 children (21.6%) from the neglected group were unable to
304 complete the task at 42-month-old, in comparison to 1 out of 91 (1.1%) in the non-neglected
305 group. At 54-month-old and at 66-month-old a remaining 15% ($n = 6/40$) and 2.5% ($n = 1/40$)
306 respectively of children exposed to neglect were still unable to complete the task. Therefore, with
307 regards to our first objective, i.e., whether there is a difference between groups on inferential
308 comprehension and receptive vocabulary, the neglected group presents significantly poorer
309 receptive language abilities compared to the non-neglected group with large to very large effect
310 sizes at 42, 54 and 66 months old (Table 2).

311 Insert Table 2 around here

312
313 To address our second objective, Table 3 illustrates significant moderate to strong
314 bivariate Pearson correlations between receptive vocabulary and inferential comprehension at all
315 three time points (from $r = .452$ to $r = .715$, $p < .001$). According to Cohen (1988), effect size
316 between receptive vocabulary at T1 and inferential comprehension at T3 indicates a medium

317 effect, as all the other associations between the two variables indicate a large effect. Therefore,
318 as regards to the second objective, the results highlight significant moderate to strong
319 correlations with medium to large effect sizes between inferential comprehension and receptive
320 vocabulary between 42 and 66 months of age (Table 3).

321 Insert Table 3 around here

322

323 To address our third objective, to determine whether rates of change in inferential
324 abilities over time was stable between the two group conditions, a 3 (time: T1, T2, T3) by 2
325 (group conditions: neglected vs non-neglected) repeated measures ANCOVA on inferential
326 comprehension was conducted, with receptive vocabulary at T1 as a covariate. Results are
327 reported in Table 4. As expected, the significant main effect of time, sphericity assumed (F
328 $(2,152) = 34.230, p < .001$) indicated that inferential comprehension changes between 42 and 66
329 months. Post hoc paired comparisons using Bonferroni correction indicate that inferential
330 comprehension improves between T1 and T2 ($M_{diff} = 18.92, 95\% \text{ CI } [14.69, 23.15], SE = 1.728,$
331 $p < .001$) and between T2 and T3 ($M_{diff} = 11.16, 95\% \text{ CI } [7.53, 14.78], SE = 1.481, p < .001$) for
332 all children.

334 Insert Table 4 around here

335

336 Figure 1 depicts two trajectories of inferential comprehension for the two group
337 conditions (neglected vs non-neglected), controlled for receptive vocabulary. Within a group, a
338 trajectory is represented by a line connecting the adjusted means of inferential comprehension
339 across the three time points (at 42 months, 54 months, 66 months of age). The Group conditions

340 x Time interaction was not significant, sphericity assumed ($F(2,152) = 1.128, p = .326$),
341 suggesting that the difference between the neglected and non-neglected trajectories remained
342 unchanged over time (Figure 1). Post hoc paired comparisons with a Bonferroni correction reveal
343 superior scores in inferential comprehension of the non-neglected group compared to that of
344 children of the neglected group averaged across the three time points ($M_{diff} = 13.52, 95\% CI$
345 $[8.61, 18.44], SE = 2.468, p < .001$). The effect size, measuring the difference between the two
346 group conditions' trajectories (neglected vs non-neglected), is of 0.544 ($p < .001$), indicating a
347 moderate effect according to Cohen (1988). Taken together, as for objective three, the findings
348 suggest that children from the neglected group demonstrate significant difficulties in inferencing,
349 a disadvantage that remains stable in their development over time compared to their non-
350 neglected peers.

351

352 Insert Figure 1 around here

353

354 **Discussion**

355 Using a longitudinal design, this study explored inferential comprehension abilities of French-
356 speaking neglected preschool children from 42 to 66 months old. Three objectives were pursued.
357 The first objective aimed to compare inferential comprehension abilities and receptive
358 vocabulary of neglected children with same aged non-neglected peers at 42, 54 and 66 months
359 old, and the second to examine the relations between these variables. The third objective aimed
360 to determine whether rates of change in inferential abilities over time were stable between the
361 two group conditions.

362 As regards the first objective, group differences were revealed at all three time points, for
363 both inferential comprehension and receptive vocabulary, with large to very large effect sizes.
364 The neglected group demonstrates significantly poorer inferential comprehension abilities and
365 lower receptive vocabularies compared to their non-neglected peers at 42, 54 and 66 months. Of
366 note, 21.6% and 15% of the children from the neglected group were unable to complete the
367 dialogic reading task (*ÉCIR*) at 42-month-old and 54-month-old respectively, with a remaining
368 2.5% of the children at 66-month-old. Given that inferential comprehension at the discourse-
369 level plays a key role on a child's ability to participate in communicative and social interactions
370 (Westby & Washington, 2017), in addition of its links with reading comprehension (Kendeou et
371 al., 2008; Kendeou et al., 2020; Paris & Paris, 2007), these findings are of great concern and
372 highlight the importance of early detection of receptive language comprehension difficulties in
373 young children exposed to neglect. Our study contributes to the existing body of literature
374 concerning the high vulnerability of language development in children who experience neglect
375 (McDonald et al., 2013; Sylvestre & Mérette, 2010; Sylvestre et al., 2023), by confirming the
376 negative consequences on the child's receptive language development.

377 With regards to the second objective, the results highlight significant moderate to strong
378 correlations between inferential comprehension and receptive vocabulary at all three time points,
379 between 42 and 66 months of age (from $r = .452$ to $r = .715$, $p < .001$), with medium to large
380 effect sizes. Along with previous research, our findings add to the large body of research
381 highlighting the strong relationship between receptive vocabulary and inferential comprehension
382 in young children (Filiatrault-Veilleux et al., 2016; Paris & Paris, 2003; Silva & Cain, 2015; van
383 Kleeck, 2008). In a longitudinal study investigating listening text comprehension in typically
384 developing preschoolers between 4 to 5 years of age, receptive word knowledge, along with

385 semantic knowledge, accounted for significant variance in both literal and inferential
386 comprehension of read-aloud stories (Florit et al., 2011). Therefore, prior to formal reading
387 instruction, receptive vocabulary appears to be an important oral language ability for inferential
388 comprehension in young children aged 3 to 6 years of age (Florit et al., 2014; Kendeou et al.,
389 2008; Silva & Cain, 2015). Inferential comprehension is a complex construct that relies on a
390 wide range of language and cognitive skills (Dawes et al., 2019; Silva & Cain, 2015). The
391 weaknesses in language abilities underpinning inferential comprehension in children exposed to
392 neglect, especially with receptive vocabulary (Eigsti & Cicchetti, 2004; Lum et al., 2015), put
393 them at risk of presenting difficulties with inferencing from a young age.

394 Further, in response to the third objective, rates of change in inferential comprehension
395 over the preschool years were stable between the two group conditions, indicating that the
396 disadvantage of children from the neglected group, when compared to their age-matched peers
397 from 42 to 66 months old of age, persisted over time. This suggests that neglected children do
398 not catch up with their peers during the preschool years. This research is the first of its kind to
399 describe the developmental trajectory of inferential comprehension in a cohort of young,
400 neglected children.

401 These findings are consistent with other results collected as part of the ELLAN study,
402 describing developmental trajectories of children exposed to neglect from 36 to 66 months
403 compared to a control group (Sylvestre et al., 2023). The study, a pioneering effort in this area,
404 outlines significant developmental differences for receptive vocabulary, expressive vocabulary
405 and morphosyntax in neglected children across time. Precisely, they found that effect sizes
406 increased for receptive and expressive vocabulary development, while MLU in morphemes
407 (morphosyntax) remained stable over time from 36 to 66 months old (Sylvestre et al., 2023).

408 Altogether, these results highlight the very high vulnerability, with great magnitude, of language
409 difficulties experienced by children exposed to neglect. Given that challenges with language
410 experienced in early childhood can have both immediate and lasting negative consequences on
411 future development of children, including academic achievement and socio-emotional
412 development (National Scientific Council on the Developing Child, 2012; Norbury et al., 2017),
413 these findings are of great concern.

414 The very nature of neglect, characterized by severe disruption of the interaction between
415 a parent and a child (Sylvestre, 2021), might explain these results. Of note, vocabulary growth
416 and language comprehension have been frequently shown to be fostered in young children by
417 engaging in high quality shared book reading activities (e.g., Deckner et al., 2006; Farrant &
418 Zubrick, 2013; Sénéchal et al., 1996). Key aspects of shared reading, such as close physical
419 proximity and opportunities for responsivity, has been shown to enhance parent-child relational
420 health (Canfield et al., 2020), and to be associated with higher quality parenting (Dexter &
421 Stacks, 2014), and less harsh parenting (Jimenez et al., 2019). In addition of benefits on parent-
422 child interactions, research has shown that reciprocal and contextual shared reading activities
423 expose children to age-appropriate level of vocabulary while ensuring lexical richness and
424 context to learn new words, in addition of exposing them to a variety of sentence lengths and
425 complexity (Hoff, 2003; Mol et al., 2009). It can be hypothesized that given the context of
426 parental behaviors in situations of neglect (Burgess & Conger, 1978; Di Sante et al., 2020;
427 Wilson et al., 2008), these children are deprived of opportunities for shared reading in the home
428 environment. Future research should explore in more detail the links between the home
429 environment, the parent-child relational health and language outcomes in young children
430 exposed to neglect.

431

432 **Strengths and limitations**

433 This study has several notable strengths that will benefit future research in this area. The
434 main strength is its use of a longitudinal design, allowing us to track developmental changes over
435 time of inferential comprehension at a very important period of a child’s development before
436 explicit reading instruction takes place. We also must highlight the use of a standardized
437 assessment of inferential comprehension in French, the *ÉCIR*, which has shown great
438 psychometric properties in previous studies with young children (Filiatrault-Veilleux et al., 2016;
439 Filiatrault-Veilleux & Desmarais, 2020). Another strength of this study relies on the composition
440 of the group of children exposed to neglect, whose exposure was confirmed by social workers of
441 child protection services for all the children, resulting in a relatively homogeneous group sample.

442 Although this study is the first one to explore inferential comprehension abilities of
443 French-speaking children exposed to neglect, some limitations must be acknowledged. First, as
444 noted, not all children have been assessed at all measurement points throughout the longitudinal
445 study and there was an imbalance in sample sizes between group conditions. Even though
446 attrition is expected given the study design, some malfunction with the equipment and behavioral
447 difficulties have also impacted the assessment process. It is possible that the inclusion of all
448 participants at all time points could have affected the results of the study, however it is unlikely,
449 given the group sizes at each time point regardless of attrition. Second, while this study included
450 a measure of receptive vocabulary abilities known to be correlated with inferential
451 comprehension, no measures of other language abilities (e.g., grammar, syntax, literal
452 comprehension) or cognitive process (e.g., theory of mind, executive functioning) were taken.

453 Such information could help identify additional factors that contribute to inferential
454 comprehension difficulties in young children exposed to neglect.

455

456 **Practical implications**

457 As evidenced by large to very large effect sizes, the magnitude of inferential comprehension
458 difficulties of neglected children is a matter of significant concern. Considering the importance
459 of inferential comprehension in the development of social competence, oral language and
460 reading abilities (Filiatrault-Veilleux et al., 2015; Kendeou et al., 2008; Kendeou et al., 2009;
461 Paris & Paris, 2007), our data supports the systematic assessment of inferential comprehension in
462 children exposed to neglect, from the age of 42 months. As such, the *ÉCIR* has been shown to be
463 an informative measure that can be used by clinicians and researchers to assess the inferential
464 comprehension abilities of French-speaking preschool children. Moreover, our study emphasizes
465 the importance of the implementation of early intervention and informed evidence-based
466 practices, in a collaborative and unified approach, that can potentially positively foster the
467 receptive language development of this population. There is a clear need to advocate for
468 accessible preschool education programs, such as Kindergarten for 4-year-olds for low-income
469 families and community resources, such as library programs that facilitate positive shared
470 reading experiences for children coming from vulnerable environments. Due to the nature of
471 neglect, this population needs support through coordinated efforts and intersectoral actions
472 within a public health framework (Child Welfare Information Gateway, 2003; Sylvestre, 2021).

473

474 **Future Research**

475 This study demonstrated the gap in inferential comprehension abilities between neglected
476 and non-neglected children. However, the scope of this study is limited, and therefore, future
477 research is needed to assess the inferencing skills of neglected children older than 66 months-old.
478 Specifically, how the gap between their same age peers at older ages compares to those found in
479 the present study. Such data would help to inform the ongoing severity of inferencing difficulties
480 in older neglected children and provide a better understanding of the links between inferential
481 comprehension and reading comprehension in educational settings. In addition, as mentioned
482 above, given the importance of the environment and parental behaviors on the child's
483 development (Burgess & Conger, 1978; Di Sante et al., 2020; Wilson et al., 2008), subsequent
484 studies should delve deeper into examining the connections among the home environment, the
485 parent-child relationships and receptive language outcomes in young children who are exposed
486 to neglect.

487

488 **Conclusion**

489 This longitudinal study showed that young French-speaking children exposed to neglect obtained
490 significantly lower scores compared to their same age peers on receptive vocabulary and
491 inferential comprehension measures from 42 to 66 months old. Furthermore, the children from
492 the neglected group demonstrated significant difficulties in inferencing, a disadvantage that
493 remained stable in their development over time compared to their non-neglected peers. These
494 results reiterate the importance of early detection of language comprehension difficulties in
495 young children coming from vulnerable environments. Given that inferential comprehension is
496 reported as part of the important set of skills used in educational settings, in both oral and written
497 discourse-level activities, early intervention should be provided and implemented at an early age,

498 that would potentially positively foster the language comprehension development of these highly
499 vulnerable children, in addition of contributing to their overall well-being.

500

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505 supported this study.

506 **Data Availability Statement**

507 All data and materials as well as software application comply with field standards. Data are
508 available upon request from the authors.

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749 **Figure 1.** Repeated-measures ANCOVA: Inferential comprehension development of the two
750 group conditions, neglected and non-neglected children, with receptive vocabulary as covariate.
751 Within a group, a trajectory is represented by a line connecting the adjusted means (and standard
752 deviation) for inferential comprehension at the three time points (42, 54 and 66 months old).
753 Group conditions x Time interaction is not significant ($p = .326$), resulting in two parallel
754 trajectories, with a significant effect size of .544 ($p < .001$) between group conditions (neglected
755 vs non-neglected).
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1 Table 1. Sociodemographic characteristics of the two group conditions (upon study entry of the
 2 ELLAN study, participants at 36 months old)

Variables	Group conditions		Group comparison	
	Neglected	Non-neglected	Pearson	Group effect
	(<i>N</i> = 37) % (<i>n</i>)	(<i>N</i> = 91) % (<i>n</i>)	Chi-square (χ^2)	(<i>p</i> Value)
Child gender (male)	62.2 (23)	46.2 (42)	2.697	.101
Number of children in the family (> 2)	45.9 (17)	22.0 (20)	7.353	.007
Family structure (single parent)	35.1 (13)	3.3 (3)	24.379	< .001
Education level of the responding parent (\leq High School)	48.6 (18)	5.5 (5)	33.234	< .001
Gross annual household income (< low income threshold) ¹	46.9 ² (15)	3.4 ³ (3)	34.367	< .001

3 ¹ Statistic Canada (2016)

4 ² *N* = 32. Missing data for five participants.

5 ³ *N* = 87. Missing data for four participants.

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10 Table 2. Means, standard deviations, ranges of measures (in raw scores), independent t-tests and
 11 effect sizes

Measures	Group conditions						Group comparison	
	Neglected			Non-neglected			<i>t</i>	Effect size ³ (Cohen's <i>d</i>)
	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>M</i>	<i>SD</i>	<i>Range</i>		
42 months old (T1)	<i>(n = 37)</i>			<i>(n = 91)</i>				
Inferential comprehension ¹	19.27	14.88	0- 47	33.86	11.67	10-58	5.516**	1.163
Receptive vocabulary ²	23.87	13.46	0-55	39.26	11.06	16-72	6.216**	1.302
54 months old (T2)	<i>(n = 40)</i>			<i>(n = 71)</i>				
Inferential comprehension ¹	35.91	16.92	0-61	54.34	9.81	24-74	7.087**	1.010
Receptive vocabulary ²	40.85	21.07	0-87	62.15	14.14	30-91	6.789**	1.288
66 months old (T3)	<i>(n = 40)</i>			<i>(n = 86)</i>				
Inferential comprehension ¹	47.55	16.47	0-66	62.03	7.18	40-76	6.893**	1.319
Receptive vocabulary ²	60.07	23.91	1-103	81.98	13.41	49-117	6.928**	1.261

12 ***p* < .001

13 ¹Raw scores *Évaluation de la Compréhension Inférentielle en Récit (É.C.I.R.)* (Filiatrault-Veilleux et al.
 14 2016); ²Raw scores *Échelle de vocabulaire en images Peabody (ÉVIP)* (Dunn et al., 1993).

15 ³Cohen's *d* effect size = .20 small effect, .50 medium effect, .80 large effect, 1.3 very large effect (Cohen,
 16 1988)

17 Table 3. Bivariate Pearson correlations¹ between receptive vocabulary and inferential
 18 comprehension ($N = 111-140$).

	1.	2.	3.	4.	5.	6.
1. Receptive vocabulary at T1	-					
2. Receptive vocabulary at T2	.679**	-				
3. Receptive vocabulary at T3	.638**	.807**	-			
4. Inferential comprehension at T1	.594**	.617**	.648**	-		
5. Inferential comprehension at T2	.548**	.619**	.715**	.604**	-	
6. Inferential comprehension at T3	.452**	.575**	.635**	.536**	.660**	--

19 ** $p < .001$.

20 ¹According to Cohen (1988), effect size for $r < .10$ indicates a small effect, $.11 < r > .49$ indicates a
 21 medium effect, $r > .50$ indicates a large effect.

22 Table 4. Repeated Measures Analysis of Covariance on Inferential comprehension ($N = 79^1$)

	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
<i>Within-subjects</i>					
Time	4840.51	1	4840.51	67.261	< .001
Time X group condition (neglected vs non-neglected)	.32	1	.32	.004	.947
Time X receptive vocabulary	100.38	1	100.38	1.395	.241
Error	5469.43	76	71.97		
<i>Between-subjects</i>					
Intercept	19269.10	1	19269.10	90.633	< .001
Group condition (neglected vs non-neglected)	6381.84	1	6381.84	30.017	< .001
Receptive Vocabulary	4231.954	1	19.905	19.905	< .001
Error	16158.09	76	212.61		

23 Notes: SS = sum of squares; MS = mean square.

24 ¹ Given attrition and fluctuation in the number of participants completing the two assessment tasks at the
 25 three time points (e.g., malfunction of the camera, children experiencing difficulties with the tasks), the
 26 total number of participants included in the analysis was 79.

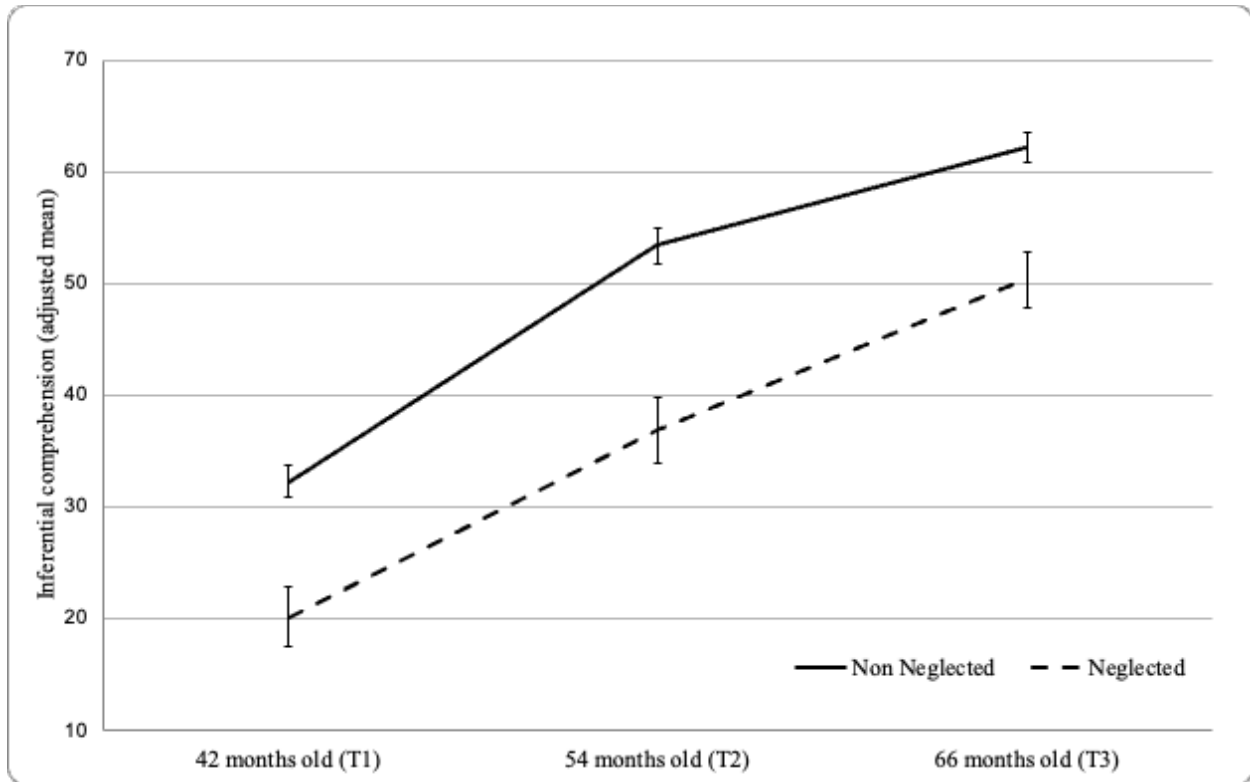


Figure 1. Repeated-measures ANCOVA: Inferential comprehension development of the two group conditions, neglected and non-neglected children, with receptive vocabulary as covariate. Within a group, a trajectory is represented by a line connecting the adjusted means (and standard deviation) for inferential comprehension at the three time points (42, 54 and 66 months old). Group conditions x Time interaction is not significant ($p = .326$), resulting in two parallel trajectories, with a significant effect size of .544 ($p < .001$) between group conditions (neglected vs non-neglected).

Appendix A

Table 5. Inference types, story context, example, and number of questions of the *Évaluation de la Compréhension Inférentielle en Récit* (É.C.I.R.) task

Inference types	Story context	Examples of questions	N of questions
Problem	A storm breaks the nest of the main character, a bird named “Pinson” while his parents are away.	What is happening?	2
Internal response	He is ... afraid because his parents left the nest and the storm arrived. / Sad because his nest is broken. / Discouraged because he cannot find a shelter	How does Pinson feel? Why?	4
Goal of the character	He is searching for a shelter.	What is Pinson looking for?	2
Attempts to solve the problem	He meets three animals who try to help him but cannot do it (a skunk, porcupine, and beaver).	Do you think Pinson will be ok with this animal? Why?	7
Prediction	He meets a boy, named Tom, who will build him a wooden bird house	What do you think will happen next?	2


Resolution

Tom built him a solid wood bird house.

Who helped him the most? Why? 2

4

6 **Table 6.** A picture, question, examples of responses and attributed score per category following the quality continuum of the
 7 scoring system in the *Évaluation de la Compréhension Inférentielle en Récit* (É.C.I.R.) task

Picture	Question 1.1	Examples of responses	Quality of response	Score
(Page 2)				
	How does Pinson feel?	Sad; Scared; Worried. Bad; He's crying. Tired; Hungry. Blue; Bird; I don't know.	Expected Incomplete Low-contingency Inadequate or off topic	3 2 1 0